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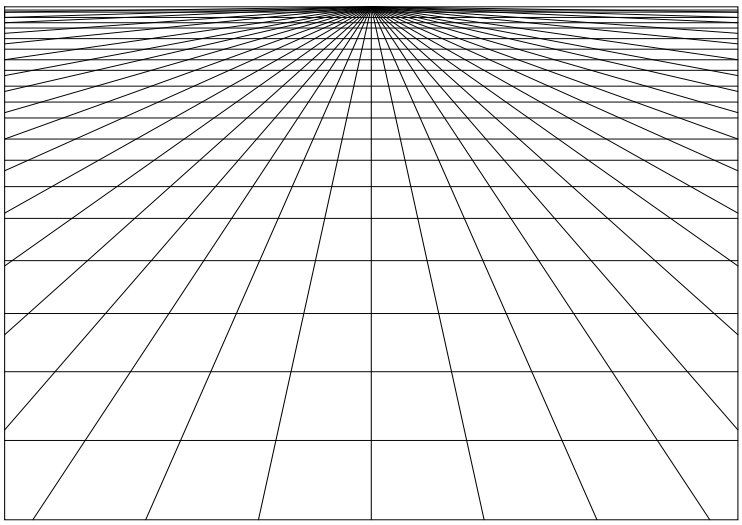

ESST MA

Defining Expertise
Solving the Climate Challenge with the Help of Science

Live Moen

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Live Moen

E-mail: Livescharffenberg@msn.com

University of Oslo

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Supervisor: Göran Sundqvist

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I would like to dedicate this thesis to my grandfather who passed away while I was writing.

ABSTRACT

This project aims to study the role of experts in shaping climate policy. The problem of climate change poses challenges to those who develop policy instruments to reduce carbon emissions; this is as a result of complexity and uncertainty within the scientific field of climate research. As a result of this, expertise has had a particularly strong influence on development of policy. A qualitative analysis of the Climate Change Act adopted in 2008 by the UK Government and the advisory expert body the Committee on Climate Change (CCC), which was established as a part of the Climate Change Act to advise the Government on climate science, is therefore used as a case study to illustrate the relationship between expertise and policy-makers. In light of Harry Collins and Robert Evans' (2002, 20007) much debated efforts to create a normative theory of expertise, as well as some of the responding critical questions presented by Sheila Jasanoff (2003) and Brian Wynne (2003) I will analyse how expertise and policy makers interact to create the appropriate means to reduce carbon emissions.

The thesis also shows how the Government wanted to create a group with different expertise to summarize climate research in a better way in order to develop the best climate policy. It further examines the way in which the experts in the Committee work to promote their own expertise within the field of climate science as a united group of experts, an effort much in line with Collins and Evans' proposed theory of expertise. Furthermore, this thesis shows that creating the CCC would be an interesting experiment as to how the Government can gather a group of experts from different scientific fields to let them work together to produce scientific advice that the Government has to listen to and create policy from, thus giving the experts a high power to influence policy.

In light of Jasanoff and Wynne's work, however, the examination shows how different framings of scientific disputes could provide better insight to the solution. The analysis also shows how the boundaries between politics and science are blurred, thus suggesting that the Committee would benefit from public participation as a way to ensure that they produce the best result possible. This thesis presents a contribution to an ongoing discussion in the field of Science and Technology Studies (STS) concerning how expertise should be classified in connection with science-related disputes.

Keywords: *Expertise, framing, co-production, policy, society, law and climate change.*

TABLE OF CONTENTS

ABBREVIATIONS

CCC The Committee on Climate Change

CO2 Greenhouse gas Carbon Dioxide

SEE Studies of Expertise and Experience

STS Science and Technology Studies

ETS Emissions Trading System

EU European Union

DECCA The Ministry of Energy and Climate Change (Part of the UK Government)

HMG Her Majesty's Government (Part of the UK Government)

ASC Adaptation Sub Committee (Part of the UK Government)

DECC Department of Energy and Climate Change (Part of the UK Government)

Defra The Department for Environment, Food and Rural Affairs (Part of the UK Government)

There is no “science” on the one hand and “society” and “values” on the other. These are dividing lines found only in our theories and imagination” (Latour 1987 in Asdal 2007: 8)

1. INTRODUCTION

1.1 OBJECTIVES AND RESEARCH QUESTIONS

With this thesis I will contribute to the ongoing and much debated effort of Science and Technology Studies (STS) scholars Harry Collins and Robert Evans to create a normative classification of scientific expertise. In their article *The Third Wave of Science Studies: Studies of Expertise and Experience,* Collins and Evans argue that the field of science studies has shown why science and technology cannot always solve technical problems in the public domain. This is particularly the case because *"The speed of political decision-making is faster than the speed of scientific consensus formation"* (Collins and Evans 2002: 127). A subject over recent years has been the need to expand the domain of technical decision-making beyond the technically qualified elite, so as to improve political legitimacy. Collins and Evans argue, however, that the "Problem of Legitimacy" has been replaced by the "Problem of Extension"—that is, by a tendency to dissolve the boundary between experts and the public so that there are no longer any grounds for limiting the indefinite extension of technical decision-making rights. Moreover, they argue that a new theory of expertise, what they call the Third Wave of Science Studies or the Studies of Expertise and Experience (SEE), is necessary to solve the problem of extension. In response to this article, Sheila Jasanoff and Brian Wynne argue that this normative classification of expertise overlooks valuable insights from the STS field regarding the relationship between society and science.

Sheila Jasanoff and Brian Wynne's critique of the Third Wave of Science Studies was not mentioned in Collins and Evans's next book *Rethinking Expertise*. As Mads Dahl Gjefsen (2009: V) mentions in his thesis as a critique of Collins and Evans, that Investigating different framings in scientific disputes will contribute to the classification of expertise. From the point of view of STS scholarship, an analytical approach focusing on the processes by which

research questions are framed or formulated is promising in terms of understanding the basis for public involvement and stance taking in science-related disputes. These are timeless but nevertheless relevant questions in the field of STS: analysing expertise, how it works and how it is organised. The STS discipline is well suited for analysis of the Climate Change Act and the CCC expert advisory body.

To shed light on this discussion, I have chosen to test the arguments from both sides of the debate on a case study concerning the British Climate Change Act and the advisory expert body, the Committee on Climate Change (CCC) In this thesis, the Committee on Climate Change "CCC" refers to the Non-Departmental Public Body set up through the Climate Change Act 2008. Doing so allows me to find out how the law frames and classifies expertise within the CCC, and how the Committee formulates and frames their scientific contributions to the law. My objective is to answer the following three questions: 1) *How does the Climate Change Act frame and define expertise within the Committee?* 2) *How does the CCC frame and formulate its scientific contributions to the Act?* 3) *How will analysing and evaluating the CCC contribute to Harry Collins and Robert Evans' efforts to create a normative theory of classification of expertise?*

1.1.1 THE STRUCTURE OF THE THESIS

Chapter one introduces the research questions, conceptual framework, and methodology of this thesis. It further provides some insight into the field of STS.

The theory is presented in chapter two, as are the issues surrounding the normative classification of expertise. In this chapter, I also present some of the concepts that will be used in my analysis.

In chapter three, I present my case study and two of my research questions. In chapter four, I analyse my case study using the work of Harry Collins, Robert Evans, Sheila Jasanoff, and

Brian Wynne in the field of classifying expertise. I also consider what contributions might be made to further develop Collins and Evans' efforts to create a normative theory of expertise. At the end of this chapter, I share some of my main findings and in chapter five the conclusions of the thesis are presented.

1.1.2 BACKGROUND FOR CHOICE OF SUBJECT

My motivation for writing this thesis stems from my interest in the interface between energy, agriculture, and the environment. On March 22, 2011, I attended a seminar at Litteraturhuset (The House of Literature in Oslo, where people can come together to communicate and promote interest in literature and reading, as well as freedom of speech issues) on the possibility of a climate change law being enacted in Norway. This seminar introduced me to a similar law enacted by the UK in 2008. The Stern Review on The Economics of Climate Change, a 700-page report published for the British Government on October 30, 2006 by economist Nicholas Stern, proved an important tool in the process of passing the Climate Change Act. The report discusses the effects of global warming on the world economy. Although this is not the first economic report written about climate change, it is the most elaborated and discussed report of its kind. The Stern Report, which offers a comprehensive cost analysis of greenhouse emissions, states that climate change is the largest and most comprehensive market failure in existence, presenting a unique challenge to the economy. The Stern Report's primary conclusion is that the benefits of strong early action on climate change outweigh the long-term costs of inaction. As a result of this report and a campaign called *The Big Ask* led by Friends of the Earth, Britain enacted a climate change law in 2008.

A climate law will ensure that climate goals are set, and that preventative measures are planned for decades in advance. The Climate Change Act makes emissions targets legally binding. A binding target of how low the greenhouse gas emissions must be in the future

provides the basis for a long-term community planning. It also creates a situation in which climate change objectives should and must be reached regardless of changing political priorities.

The Climate Change Act combines all of my interests; it addresses issues concerning ecological economics also called living economy, sustainability, long-term commitments across government changes, responsibility, expertise, and of course, putting it all into practice. In my thesis, I investigate the links between the Committee on Climate Change and the Climate Change Act itself during the period from 2008 to 2011.

I am particularly interested in investigating the relations between science and policy and how policy can help to "control" climate change issues. Moreover, the Act could serve as a template for other laws that can help to ensure a more sustainable environment in the future. The British experience can also be a useful contribution in a debate about how a long-term, reliable and stable climate and energy policy should take form in Norway and other countries.

1.1.3 THE FIELD OF SCIENCE AND TECHNOLOGY STUDIES

According to the handbook of Science and Technology Studies (STS), STS began to take shape as a discipline in the 1960s. There were calls for a “science of science”, and for attempts to create an explicit and rational “science policy”. In 1965, the Science of Science Foundation was established in London. The works of Robert K. Merton (1973) in the sociology of science contributed to the birth of STS, but, as a number of early critics pointed out, this tradition took for granted the essentially positive view of science that was also implied in the drive for rational scientific policy. Drawing from work in the disciplines of History, Sociology, Philosophy, Anthropology, Cognitive Psychology, and Linguistics, the 1970s saw the emergence of a radical and new “sociology of scientific knowledge” (SSK). This research had an academic, humanistic aim, and drew much of its initial inspiration from

the work of Thomas Kuhn and to a lesser extent from J. D. Bernal and Michael Polanyi. The "swing away from science in the schools" led to discussions about science with "social responsibility, reform science education—to liberalise it, to make it more human" (Edge 1995: 4). By the end of the decade, innovations on these lines had been made. One major result of these educational innovations of interdisciplinary interactions was that serious attention was paid to interdisciplinary collaborations, in both teaching and research. This feature has profoundly influenced the course of STS (Edge 1995: 3-11). The emerging field of STS has adopted as its fundamental concern the investigation of knowledge societies in all their complexity: their structure and practices, their ideas and material products, and their trajectories of change. Having grown from many disciplines means that STS today encompasses a rich tapestry of theoretical and methodological perspectives, all specifically directed toward investigating the place of science and technology in society (Jasanoff 2004).

There are challenges around how to manage science and to control the community of experts. These questions are old but still relevant and controversial. This is where the STS field can contribute: STS research criticises that having scientific knowledge makes it possible to speak truth to power. This is complicated; it never goes only in one direction, where science only affects society or politics and not the other way around.

In the field of STS, some authors have argued that awareness of the environmental crisis has influenced a partial shift in the social contract between science and politics (Irwin and Michael 2003). Disenchantment and loss of public trust in science and technology (Wynne 2008) have culminated the expectations placed on environmental sciences and green technologies. The environmentalist movement is critical of science as well as deeply dependent on it.

My theoretical chapter demonstrates a thorough introduction to the debate surrounding the theory of expertise presented mainly by Harry Collins and Robert Evans, Sheila Jasanoff and

Brian Wynne. Analysis of the use of expertise and how it is classified is central to the field of STS, as is the relationship between expertise and politics. It is also important to note that my thesis will not evaluate the merits or efficacy of the Climate Change Act. Rather, based on the field of STS, I will discuss the use of experts in environmental politics. Who are the experts on the environment and what factors give them credibility? An important task for my thesis will be to investigate how expertise is recognized, framed, and disseminated within the political realm.

1.2 METHODOLOGY AND DESCRIPTION OF DATA

This study falls within the fields of environmental and STS studies, and it addresses expertise within the field of environmental issues. On a normative level, this thesis seeks a conceptual means toward inclusive forms of environmental governance (Jasanoff 2001).

In order to ensure good quality research, it is important to consider reliability and validity. Reliability is an important criterion in social research as it is tied to whether the research is conducted in a credible and trustful manner. Validity is tied to the legitimacy of the interpretations the researcher has reached (Thagaard 2009).

I will rely on theory from the field of STS for analysis in my thesis. I also rely on other disciplines including Sociology, Environmental ecology studies, Economics, and Anthropology as part of my literature. As the primary source I will draw upon to describe my case, I look to the Climate Change Act published by the Department for Energy and Climate Change (DECC) and the Department for Environment, Food and Rural Affairs (Defra). A major part of my empirical work concerns the Committee on Climate Change. To this end, I focus on three progress reports as the foundation of my empirical data: *Meeting Carbon Budgets – the need for a step change; Progress report to Parliament Committee on Climate*

Change October 2009, Meeting Carbon Budgets ensuring a low-carbon recovery. 2nd progress report to Parliament Committee on Climate Change June 2010, Meeting Carbon budgets: -3rd Progress Report to Parliament – 30 June 2011. Furthermore, I use the three corporate plans published in 2008-2009, 2009-2010, and the *Committee on Climate Change framework document* published by Her Majesty's Government. I also include information from the remaining reports that have been published by the CCC, but the seven reports I mention above form the foundation of my empirical work concerning the CCC. I also include literature from different organisations and institutions that are related to my case.

The Climate Change Act and the Committee were established in 2008. I have chosen to include the entire period from 2008 through June 2011. I rely mostly on the British Government and the Committee on Climate Change's own records and documents.

Throughout the data collection process I have also consulted different documents that I found of relevance to my thesis. These documents are briefly presented before referring to them in the text.

1.2.1 THE CASE

A common understanding of the case study tells us that it is research on an empirically limited unit, such as a group or an organization where the phenomenon is being studied in its natural environment and the research is based on several sources of data (Thagaard 2009).

Yin (2009) describes that a case study can be used as a template for further investigation. The purpose of reliability is to ensure the possibility of replication of the study. Reliability is achieved here by including the sources of information, as with references, so that any use of data can be scrutinized. As Yin (2009), discusses, case studies can be supported by several types of data it is seen as advantageous if one can use more than one source at once. Several

sources can then supplement and strengthen each other.

In this thesis, I have decided to study a single organisation, as an individual case will generate in-depth information on this specific case. However, there is no assurance that the result and conclusions will be applicable to all organisations of this kind and any kind of generalisation can therefore not be made from this study alone. Only through repetition of studies of similar cases can this case study contribute to the theoretical development of classifications of expertise (Yin 2009).

1.2.2 QUALITATIVE ANALYSIS

In this thesis I have used a hermeneutic approach, i.e. the doctrine of interpretation of texts. This methodological principle maintains that one idea will be understood by another idea and another idea through the first, in other words, both a contextual and cognitive understanding. Additionally, the thesis will conduct a qualitative literature study to examine the Climate Change Act and Climate Change Committee. A study of literature seeks to gather information, process it critically, and then summarise the material. This material in its processed form will then form the basis for discussion that will reveal the problem and thus contribute to the theoretical development of expertise.

As mentioned in the text above a key method of analysis in this paper is the interpretation of text. I started out reading official documents regarding the Climate Change Act and reports from individual publishers. This gave me basic knowledge about the Climate Change Act, and literature to further investigated the Committee on Climate Change and its connection to the Climate Change Act. Since the Committee on Climate Change actively and knowingly obtain attention to their expertise, both through its own marketing and editorial media coverage, the amount of text material available to the public was satisfactory. All sources that I have

collected are considered to be relevant to the research questions. A high number of press clippings, public appearances by the Committees advocates and through their websites have been studied in connection to my thesis. Only the most relevant of these are referred to, and to make the analysis valid and reliable, I have attached the sources that I have found online with the URLs to the list of references. Thagaard (2003) emphasizes that written sources must be understood from its context and purpose, and it is obvious that the Committees promotional materials, publications and website will seek to present the committee and their expertise in a positive way. This is balanced by also analysing literature that is skeptical of Committee. I also rely extensively on literature from the field of STS to analyse the classification of expertise placed in the context of the Committee on Climate Change

In order to achieve a comprehensive approach to the problem, the most suitable literature must be used. It is necessary to be able to trust what is written in the literature being used, and to ensure that important information is not omitted. A literature review makes it possible to specialise in a subject, yet on the other hand, it is difficult to question the written sources. It is therefore necessary to rely on theory, self-knowledge, and critical ability to process the material. Although it is impossible to free myself from my own past understanding and the society I live in, individual performances and background, my aim is always to be as objective, analytical, and critical as possible.

Throughout this chapter my aim was to explain my methodological and analytical strategy and choices in order to increase the reliability of this research.

2. INTRODUCTION TO THE THEORY OF EXPERTISE AND TO CONCEPTS OF CO-PRODUCTION AND FRAMING

2.1 DEBATING EXPERTISE

The definition of "expertise" is not a matter that concerns just Harry Collins and Robert Evans and other STS scholars, nor is it strictly an academic subject. On the contrary, it is a highly disputed political issue. Increasingly, citizens organize themselves to validate or contest this definition (for instance, activists of environmental movements may claim that scientific knowledge on Genetically Modified Organisms (GMOs) is uncertain, so it should not count as reliable expertise). Conflicts and disagreements regarding science and technology make it clear that there is a diversity of political cultures and social understandings of expertise (Jasanoff 2005). Furthermore, Nelkin (1975: 36) explains that the reason experts have authority is that they are expected to make their interpretations and analysis based on a rational and objective thinking.

According to Collins and Evans (2007:13), there is a need for a new sociology of expertise. To better understand the function of expertise, Collins and Evans analyse the meaning of expertise and put forth a definition of experts. Acquiring expertise is a social process, a matter of socialization with expert groups, and expertise can diminish if time is spent away from the groups. Collins and Evans (2007: 14) present the "Periodic Table of Expertise" wherein scientific expertise is made comparable to various forms of lay knowledge. I will now briefly present some of the different forms of expertise from their table I think are relevant for my thesis.

Ubiquitous expertise is the expertise that includes the endless list of indescribable skills it takes to live in a human society. To illustrate this point, Collins and Evans (2007: 16-18, 2-3) present the example of the French language as it is in England and as it is in France. A person

who can speak French fluently in England is considered an expert, and may be able to get paid to work as a translator or interpreter, while someone who is fluent in French in France is not a “French Expert”. If, however, he or she speaks fluent English in France, he or she might be called an expert in English. Contributory expertise refers to the ability to engage in the full range of activities associated with membership of a community. It also encompasses tacit knowledge, as well as practical, craft, and linguistic skills. Interactional expertise, on the other hand, is contributory expertise minus the practical or craft skill. As a result, a person with interactional expertise is fully able to talk knowledgably about a topic, but is unable to carry out the practical tasks associated with it. More informally, a person with interactional expertise can “talk the talk” but not “walk the walk” (Collins and Evans 2007: 28-30).

According to Collins and Evans, one must distinguish between different types of expertise. This can contribute to making the existing knowledge more evident for example in a controversy. This can help to change the direction and also contribute to a fruitful discourse. Collins and Evans go on to explain the notion of a core-set. A core-set has been defined as being made up of those scientists deeply involved in experimentation or theorisation directly relevant to a scientific controversy or debate. A core-set is often quite small, consisting of perhaps a dozen scientists (Collins and Evans 2002). A core-group is a group of scientists that emerges after a controversy has been settled. It is only the members of the core-sets or the core-group, which can contribute to the formation of consensus if the science is only likely to be understood by a small number of people with a specialised knowledge or interest.

However, it is not always easy to define the boundaries of a core-set because disputes within a core-set often involve the boundary work of defining people as legitimate or illegitimate commentators. Having accepted that to categorise expertise makes sense despite the boundary problems, the task is to begin to work out what these types of expertise mean and how they fit together.

To separate the different definitions from one another, Collins and Evans (2002) use Brian Wynne's study of the relationship between scientists and sheep farmers after the radioactive fallout from the Chernobyl disaster which contaminated the Cumbrian fells (Wynne 1996). Wynne found that the sheep farmers knew a great deal about the ecology of sheep, and about their behaviour. They also had a great deal of knowledge about the rainwater on the fells. This knowledge was relevant to the discussion of how the sheep and the fells should be treated so as to minimize the impact of the contamination. The farmers have characteristics of a core-group of experts in terms of experience in the ecology on sheep living on the grasslands, even though they have no formal qualifications. According to Collins and Evans (2002), the farmers have contributory expertise, which in some respects is more important than that of scientists working for the relevant governmental department.

The scientists claimed the radioactivity would only remain in the soil for a couple of weeks and so a ban was posted on Cumbrian sheep. After testing the soil again later, the levels were still the same. After this, the scientists introduced a ban on sheep from Cumbria. It was difficult for farmers to keep the sheep during winter due to the expensive costs for hay. They were unable to sell the wool because it had been dyed orange by the experts. The farmers now only had two choices. They could either believe the scientists who told them that contamination would go away with time or they could sell the sheep at extremely low prices. Many farmers believed the experts and kept waiting until they could sell their sheep uncontaminated. In the process, they lost a lot of money or just gave up. Eventually, it turned out that the method the experts had used to test the soil in Cumbria was not appropriate for the kind of soils found there. The experts should have included the farmers' expertise on the soil and vegetation on the pasture where the sheep grazed.

The scientists, however, were reluctant to take any advice from the farmers. In the end, taking such advice would have proved beneficial. This seemingly trivial point helps us to

understand what expertise is. The normative point that follows is that the body of expertise that should have emerged in respect of the Cumbrian sheep was a culmination of the separate contributory expertise possessed by the scientist and the farmers. The scientists' expertise was not at risk of being displaced by that of the farmers; it was, or should have been, added to by that of the farmers. To produce the optimum outcome, Collins and Evans (2002) suggest that the scientists needed to have interactional expertise to absorb the expertise of the farmers. Unfortunately, they seemed reluctant either to develop or to use such expertise.

Wave Two analyses the problem of the classifying experts who play a role in a debate, these experts can only be distinguished after the dust has settled, after it becomes clear whose claims became most convincing. Collins and Evans (2002) promote a third wave of science studies to deal with the problem of how to make decisions based on scientific knowledge before there is a scientific consensus. Decisions of public concern have to be made according to a timetable established within the political sphere not the scientific or technical sphere;

> The decisions have to be made before the scientific dust has settled because the pace of politics is faster than the pace of scientific consensus formation. Political decision-makers are, therefore, continually forced to define classes of expert before the dust has settled (Collins and Evans 2002: 269)

What Collins and Evans argue is that sociologists of scientific knowledge, also have a duty to make history as well as reflect on it; they have a role to play in making history using their area of expertise namely knowledge. The Third Wave of science studies, SEE, turns, on a normative theory of expertise. The aim is to address the question of who should and who should not be contributing to decision-making using their expertise. According to Collins and Evans (2002) under Wave Three, expert and political rights can be seen to be much more balanced because of the new understanding of contested science that emerged from Wave Two. Collins and Evans (2002) resurrect the old distinction between the political sphere and

the sphere of expertise, but in this "new" model Collins and Evans wish to draw a boundary no longer between the class of professionals accredited experts and the rest; but between groups of specialists and the rest.

2.1.1 INTRODUCTION OF FRAMING AND CO-PRODUCTION

For Collins and Evans, expertise should be defined on the basis of knowledge standards. The final decision on whether some citizen groups have valid knowledge that should be included in technical decision-making corresponds to the academic experts. Interestingly, however, Collins and Evans present a rather static picture of the science-society interplay. For instance, Collins and Evans do not take into account that there has been a transformation of the traditional use of science as well as the spaces where scientific knowledge is developed. They defend the idea that it is possible to establish a distinction between facts and values, or science and politics (Irwin and Michael 2003).

Wynne (2003) believes that Collins and Evans' approach reflects a flawed if widespread understanding of the problem of legitimacy. Instead of determining whether experts, like the ones in the case of the Cumbrian sheep farmers, are recognised or neglected, the problem of legitimacy has more to do with the institutional neglect of issues of public meaning. It is also important to ask how public issues are framed and thus given meaning. They then define the public domain to be only about whether or not something is true. They entirely ignore the fact that public policy processes, and public reactions to scientific discourse of nature and society, are processes often of implicit negotiations of public meanings.

Furthermore Wynne looks to the field of Sociology of Scientific Knowledge (SSK) which considers the social influences and the role that social factors play in scientific development and unaddressed questions about what is "core" in the core-set and why is it considered "the

core"? The aforementioned core-set refers to those scientists deeply involved in experimentation or theorisation which is directly relevant to a scientific controversy or debate.

To elaborate on the concept of framing and the conflicting framings of the meaning of the issues, Wynne looks to the Brent Spar controversy, which concerns Shell dumping a disused platform on the North Atlantic ocean floor. Greenpeace activists launched a campaign to highlight the irresponsible dumping. Facing a consumer boycott of Shell's petroleum, Shell decided to abandon their plans of dumping the platform. Greenpeace was later accused of deliberately misrepresenting the environmental risks posed by Brent Spar due to incorrect analysis of toxic wastes in the platform dump. Greenpeace, on the other hand, was not concerned with the one platform alone but with the fact that this was the first of 400 or more such platforms that would soon be decommissioned from the North Sea. If these were dumped, it could set a precedent for dumping all sorts of other waste, including UK nuclear waste-inventories that had been slated for ocean bed disposal. Moreover, Wynne (2003) explains that the propositional issue of "is it safe?" has to be accompanied by a definition of what "it" is, as well as what "safe" is.

In the *The Third Wave of Science Studies* Collins and Evans (2002) say nothing about the importance of context and the questions of meanings for such public issues. Even if the farmers' limited specialist propositional knowledge had been recognized and used by the scientist for example, knowledge about local variations in environmental conditions, would still make the whole relationship a question of the power to define the meaning of the questions. In this case it remained with the institutional experts: scientists and officials (Wynne 2003).

According to Jasnoff (2003), it is the preoccupation with the mutual embedding of natural knowledge and social order, their co-production, which gives the accurate and authoritative work in science studies its staying power. For example, with the Cumbrian sheep farmers, it

was not merely that the farmers and radiation experts possessed different complementary knowledge about grazing conditions, local soils, and radioactive caesium uptake into vegetation. It was about the differences in their life worlds, entailing altogether different perceptions of uncertainty, predictability, and control. The knowledge stemming from these divergent experimental contexts was simply not additive because it represented radically other ways of understanding the world.

Furthermore, Jasanoff (2004) explains that expertise is not only something that is in the heads and hands of skilled persons, constituted through their deep familiarity with the problem in question, but rather that it is something acquired, and deployed within particular historical, political, and cultural contexts. Accordingly, who counts as an expert and what counts, as expertise in UK public health or environmental controversies may not necessarily be who or what would count for the same purpose in Germany or India or the USA.

It is hard to find forms of human organization or behaviour whose structure and function have not been affected, to some extent, by science and technology. What happens in science and technology today is interwoven with issues of meaning, values, and power in ways that demand sustained critical inquiry. As Jasanoff (2004: 150) points out, “In what conceptual terms, then, should we discuss the relationships between the ordering of *nature* through knowledge and technology and the ordering of *society* through power and culture?”

To fill this void, Jasanoff (2004b) elaborates on the concept of co-production, which has recently gained ground in the emerging field of Science and Technology Studies.

2.1.2 CO-PRODUCTION

Co-production, according to Jasanoff (2004b), is a way to gain explanatory power in broad areas of both present and past human activity by thinking of natural and social orders as co-produced. Briefly stated, co-production is shorthand for the proposition that the ways in

which we know and represent the world (both society and nature) are inseparable from the ways we choose to live in them. Society cannot function without knowledge any more than knowledge can exist without appropriate social supports. Scientific knowledge, in particular, is not a transcendent mirror of reality. It both embeds and is embedded in social practices, identities, norms, conventions, discourses, instruments and institutions in short, in all the building blocks of what we term social.

However, it is important to remember that co-production does not seek to foreclose competing explanations by laying claim to one dominant and all-powerful truth. It offers instead a new way of exploring the waters of human history, where politics, knowledge and invention are continually in flux (Jasanoff 2004b). Furthermore, Jasanoff (2004c) explains that co-production is not about ideas alone; it is equally about concrete, physical things. It is not only about how people organise or express themselves, but also about what they value and how they assume responsibility for their ideas and their inventions. Equally to the point, co-production occurs neither at random nor contingently, but along certain well-documented pathways.

In the article *The Role of Science in Environmental Regimes: The Case of LRTAP*, Lidskog and Sundqvist (2002: 77-85) explain it is becoming harder to act without having science as a partner; there is an increase in people using science as a basis for their own positions in political debates. Furthermore, Lidskog and Sundqvist (2002) write about a scientisation of environmental policy; however, a policy of scientisation also means a politicisation of science. Furthermore, they look at the theory of SSK again to understand three important findings that are crucial when analysing the role of science in environmental governance: namely, that knowledge never moves freely, that the value of science is the result of negotiation, and that science and policy are co-produced. Miller (2004: 254) describes the value of the co-production idiom, which allows the observer to become familiar with a number of ways that

knowledge and the social order will be combined in the emergence of new phenomenon, such as climate change. Both Jasanoff and Wynne are concerned with the framing and context of understanding and defining expertise in science related issues. To further elaborate, the following section of this thesis will present information on the concept of framing.

2.1.3 FRAMING

According to Mads Dahl Gjefsen (2009), the concept of framing as understood in relation to discourse analysis is commonly traced back to anthropologist Gregory Bateson (1972). According to Matthew Nisbet (2009), framing as a concept and an area of research spans disciplines of social science. Frames are interpretive storylines that set a specific train of thought in motion, communicating why an issue might be a problem, who or what might be responsible for it, and what should be done about it. Framing is an unavoidable reality of the communication process, especially as applied to public affairs and policy. There is no such thing as unframed information, and the most successful communicators are very proficient at framing, whether using frames intentionally or intuitively.

Experts employ frames to simplify technical details and make them persuasive. Furthermore, Nisbet (2009) explains that framing is not synonymous with placing a false spin on an issue, even though some experts, advocates, journalists, and policymakers certainly do spin evidence and facts. Rather, in an attempt to remain true to what is conventionally known about an issue, as a communication necessity, framing can be used to pare down information, granting greater weight to certain considerations and elements over others. The earliest formal work on framing traces back four decades to sociologist Erving Goffman, who described words and nonverbal interactions as helping individuals negotiate meaning through the lens of existing cultural beliefs and world views. In the 1970s, cognitive psychologists Daniel Kahneman and Amos Tversky applied framing in experimental designs to understand risk

judgments and consumer choices, concluding in their Nobel Prize-winning research that, "perception is reference dependent." If individuals are given an ambiguous or uncertain situation to consider, the different ways in which a message is presented or framed apart from the content itself can result in very different responses, depending on the terminology used to describe the problem or the visual context provided in the message (Nisbet 2009). Furthermore, Erving Goffman (1974: 10-11) investigated frames as those identifiable elements, which together make up the definitions of social situations. Thus frames can be understood as the unspoken sets of associations that are used to make sense of situations, statements or events real or imagined (Gjefsen 2009: 30). Furthermore, Gjefsen (2009: 31) has noted that:

> The notion of *frame,* then, is similar to everyday expressions such as *context* and *setting,* which help observers interpret events, the important analytical distinction being that Goffman refers to a theorised notion of what he perceived as basic mental categories, as opposed to the larger *physical* context in which some aspect of reality is being observed (although such wider context do, of course, influence the mental frames invoked in any given situation).

Wynne's (2003: 402) use of the term framing is the most prevalent in much of the literature today, as mentioned earlier in this chapter. Wynne (2003) writes that the crucial shortcoming of Collins and Evans is their lack of consideration for "how public issues are framed and thus given meaning."

Investigating different framings in scientific disputes can provide a deeper understanding of the different contexts within the dispute, thus contributing to better solutions. In order to evaluate these theories of classifying expertise I will test them on a case. By using a case study, I can evaluate my findings and contribute to the development of the works on defining expertise.

3. THE IMPLEMENTATION OF THE CLIMATE CHANGE ACT AND THE COMMITTEE ON CLIMATE CHANGE

I will now present a summary of the path leading to the Climate Change Act, which was established in 2008 in the United Kingdom. To elaborate, I look to *The UK Climate Change Act 2008-Lessons for International Climate Laws, an independent review by Client Earth*, a document published in 2009 by an environmental organization that works to protect the environment through advocacy, litigation and research. Furthermore, I consult *the Climate Change Act 2008* (Her Majesty's Government 2008) and a document published by the World Wildlife Fund *Den Britiske klimaloven 2011* to provide the best insight into the Climate Change Act.

3.1 THE PATH LEADING TO THE CLIMATE CHANGE ACT

According to Friends of the Earth (2008), the initiative behind the law was the need for legal grounds that would get politicians to actually carry out promises they presented in their political programs. At the same time, climate change increasingly became a higher priority on the political agenda. The threat became even clearer when the Intergovernmental Panel on Climate Change published the *Special Report on Renewable Energy Sources and Climate Change Mitigation*, in 2007 (IPCC 2011). The report *The Stern Review* which elaborates on the financial aspects of the climate threat written by Sir Nicholas Stern, professor in Economics at College de France. Al Gore's movie *An Inconvenient Truth* drew a large audience to the cinemas and BBC icon David Attenborough told not just about nature's magical greatness, but also shed light on the climate threat.

With broad bipartisan support in parliament and total support from important organisations in British society, among them the Confederation of British Industry and the Trade Union Congress, the Act was passed on November 26, 2008. The Act had, of course, additional support from the environmental groups led by Friends of the Earth. This organisation, consisting of 200 local groups throughout the UK, was the first to promote the ideas of a climate act. The co-operation between the various environmental organisations helped to apply the additional needed pressure.

According to Bjartnes (2011: 6-10), all of these factors helped to create an environment for the climate change issue in which political action could be motivated. When Britain had presidency of the EU in 2005 and later in the G8, then Prime Minister Tony Blair made climate change one of the most important issues on his agenda. His actions in the international arena resulted in additional pressure on him in Britain because he had to live up to his international commitments. At the same time, David Cameron, the elected leader of the Conservative Party was highly engaged in the climate issues and his advisers saw this as a huge potential to build his image as a responsible and environmentally conscious leader. Cameron's advisers also saw the Climate Change Act as a part of his strategy. (Bjartnes 2011: 13-16).

There was, of course, an opposition to the broad consensus with Nigel Lawson as a prominent spokesperson. Nigel Lawson could be called the grandfather of British neo-liberal economics. According to Repeal the Act, an organization that works against the Climate Change Act (2011), the Climate Change Act risks burdening the British economy and consequently undermining competitiveness and the attractiveness of the UK as a place to do business. Further, Repeal the Act (2011) believes that climate change science is not well established, and that there are flaws in the climate change science of the IPCC assessments reports. Therefore, there is no sound reason to impose expensive and restrictive public policy

decisions on the British people without first providing convincing evidence that human activities are causing dangerous climate change beyond that resulting from natural causes.

The 2008 Climate Change Act commits the United Kingdom, uniquely in the world, to cut their CO2 emissions by 80 percent by 2050. This comes at a cost of up to £18.3 billion each year for the next four decades. In cash terms this amounts to £734 billion, making it far and above the most expensive law put through Parliament. This will equate to more than £880 a year for every household in the country. According to Repeal the Act (2011b), the UK will pay for more useless windmills and rapidly rising carbon taxes, high electricity bills, and other harsh carbon-reduction regulatory costs. The Climate Change Act will potentially destroy the economy by causing the export of British jobs to countries without carbon taxes, become the cause of fuel poverty for more than 5 million British citizens, raise the price of food, clothing, travel and continue to litter The British landscape with wind farms.

3.1.1 MAIN POINTS OF THE CLIMATE CHANGE ACT

The following are the main points of the Climate Change Act:

- Enactment of the 2050 target (80 percent reduction compared to 1990)
- Enactment of the 2020 target (as amended in 2009 from 26 to 34 percent reduction compared to 1990)
- The introduction of a binding maximum limit of greenhouse gas emissions for each five year period up to 2050 (“carbon budgets”)
- The Department of Energy and Climate Change are made responsible for attaining both the 2050 target and for reaching the goals of each and every carbon budget
- Annual reporting on goal attainment

- Comprehensive procedures for determining and changing targets for budget periods and distributing responsibilities for implementing the necessary measures to make this possible
- Establishing an independent Committee on Climate Change (CCC), which should be central in setting the agenda in relation to most decisions taken in pursuance of law. In addition it will provide its annual assessment of progress and achievement (HMG 2008)

According to Her Majesty's Government (2008) the Act is broken into four sections as follows:

Section 1. Carbon target and budgeting establishes the key elements of the legislation: the 2050 target and the carbon budgets system. The Act establishes a legal duty on the Government to reduce the UK's GHG emissions by at least 80 percent below 1990 levels by the year 2050 as well as an interim target for 2020. The Government must also establish a series of carbon budgets every five years, and must then prepare policies and proposals to meet those budgets. Section one also defines the requirement to establish a system of carbon accounting.

Section 2. The Committee on Climate Change establishes an independent Committee to advise the Government on the targets, budgets, and other matters related to action on climate change (both mitigation and adaptation), and to report annually to Parliament on progress towards meeting the targets and budgets.

Section 3. Trading schemes operated by setting caps on total GHG emissions from particular types of activities or sectors, and can limit high emission activities or encourage low-carbon or GHG-reducing activities.

Section 4. Impact and adaptation of climate change requires regular reports assessing how climate change is expected to affect the UK, as well as programmes for adaptation to climate

change to respond to the impacts and risks identified in the reports (Client Earth 2009: 13-20, Climate Change Act 2008).

According to Client Earth (2009: 13-20), the Act applies to the whole of the UK. The core duties under the Act (such as setting the 2050 target and the carbon budgets) apply to the Secretary of State and accordingly to the UK Government as a whole. However, the term "national authorities" in the legislation refers to the Secretary of State and the Governments of Scotland, Wales, and Northern Ireland (known as the devolved administrations). Some of the powers and responsibilities established under the Act (e.g. the power to request the advice of the CCC) apply to all the national authorities. The Secretary of State must also consult with the devolved administrations on a wide range of matters (including setting the 2050 target and the level of carbon budgets). In addition, some provisions of the Act apply only to Wales. Scotland has also passed its own national climate change legislation, the Climate Change (Scotland) Act 2009.

According to a central provision of the Act, it is the duty of the Secretary of State to ensure that the net UK carbon account for the year 2050 is at least 80 percent lower than the 1990 baseline. The provision creates a legal duty for the UK Government to reduce the UK's emissions of Green House Gas emissions (GHG) by at least 80 percent below 1990 levels by 2050. The UK's emissions are adjusted to account for any carbon units bought from overseas "credits" or disposed of to third party "debits". The 80 percent target is a unilateral target, which the UK has adopted into national legislation in the absence of EU or international commitments to such a target (HMG 2008).

The Act covers the UK's emissions of CO2 and other specified GHG emissions. The reduction in GHG emissions required to comply with the duty can be achieved through actions taken in the UK and abroad. However, the Government has a duty under the Act to consider the need for UK domestic action on climate change in relation to both the 2050

target and the carbon budgets. The Government also has the power to amend the 2050 target, but this power can only be exercised under certain circumstances. The Act includes that it would be appropriate to change the target where the Government considers that there have been significant developments in scientific knowledge about climate change, European international law, or policy (HMG 2008).

In addition, developments at the EU and international levels such as a new international treaty on climate change could affect the UK's commitments and make it appropriate to change the UK's national target. The legislation allows the target to be "amended", which could mean an increase or a decrease to the target, depending on the circumstances and what the Secretary of State considers appropriate. The year 1990, which is used as a baseline, can also be amended in response to significant developments in European or international law or policy.

According to HMG (2008), in addition to the 2050 target, the Act provides for an interim GHG emissions reduction target for 2020. The 2020 target must be set as part of the carbon budgeting process. Under section 5 of the Act, the carbon budget must be at least 34 percent lower than the 1990 baseline. The 2020 target can be amended in a similar way to that described above in relation to the 2050 target.

The 2050 target is supported by a series of carbon budgets. The Government must set these budgets for the net UK carbon account over consecutive five-year periods. The Government has a legal duty under the Act to ensure that the net UK carbon account for a given budgetary period does not exceed the level of the carbon budget. The Act required that the first three carbon budgets (2008-2012, 2013-2017 and 2018-2022) were set by June 1, 2009. Future budgets must be set at least 11 years in advance. For example, the next budget to be fixed—the fourth budget for 2023-2027—must be set by the end of June 2012. The carbon budgets are intended to set the trajectory for emissions reductions between 2008 and 2050. The

budgets must be set with the intention of meeting the 2050 target and complying with the British, European, and international obligations. The level of the budgets, which include the years 2020 and 2050, must comply respectively with the targets for those years. Accordingly, the budget which includes the year 2020 must include at least 34 percent emissions reduction, and for 2050 at least 80 percent emissions reduction. Section 5 includes a power to set targets for future years (such as years after 2050), and if such a target is set, then the carbon budget for the period including that year must meet the relevant target. Carbon budgets are set by the Government through a statutory order, following advice from the CCC, consultation with the devolved administrations, and approval by Parliament (Client Earth 2009: 20-21, Climate Change Act 2008).

According to HM Government (2008), the Act establishes a number of new reporting requirements, and the Government must lay reports before Parliament as follows: reports setting out the Government's expectations of the indicative annual ranges for the net UK carbon account for each year within a budgetary period, and on proposals and policies for meeting the carbon budgets for current and future budgetary periods. The reports must include details on how the proposals and policies will affect different sectors of the economy, the timescales over which the policies are expected to take effect, and how carbon units will be used in the budgetary period. Reports under the Act must be laid before parliament no later than 31 March in the second year after the year to which the period relates; for instance, the 2008 report must be laid by March 31, 2010.

The Government has the power to borrow and bank emissions between budgetary periods. Up to one percent of the carbon budget of a future budgetary period may be carried back to the preceding budgetary period. The intended effect of this adjustment is to reduce the future budget and increase the earlier budget (in effect reducing emissions under the earlier budget less challenging to achieve). Alternatively, the whole or part of any amount by which a

carbon budget exceeds the net UK carbon account may be carried forward with the effect of increasing the future carbon budget. The procedure for making such adjustments involves consultation with the devolved administrations, and seeking and taking into account the advice of the CCC (Client Earth 2008 27-30).

3.2 RESEARCH QUESTION NUMBER ONE: HOW DOES THE CLIMATE CHANGE ACT FRAME AND DEFINE EXPERTISE WITHIN THE COMMITTEE?

I investigate how the Climate Change Act frames and defines the climate issue problems. By doing so I can also investigate how the Climate Change Act frames and defines expertise within the CCC. As Miller (2004: 244) describes,

> Only when the Earth's climate was re-imagined as a global system, bringing views of the atmosphere into line with assumptions about the jurisdiction of international institutions, did claims about climate change begin to engage with debates about international politics.

According to the British Government, intervention was necessary since climate change is caused by emissions of greenhouse gases into the atmosphere. An externality exists, as those who emit do not have to bear directly the full cost of their actions. The global causes and consequences of climate change, coupled with the long-term and persistent nature of its impacts, strengthens the need for Government action. In addition, there may be barriers to optimal adaption caused by, for example, uncertainty and lack of information about the impacts of climate change. The Act creates a framework, which enables the UK to meet its domestic targets, as well as ensuring that the UK can meet existing and future international commitments for emissions reductions (DECC 2009).

One important effect of the climate law has been increased awareness of this issue amongst politicians. It has created greater focus on action. The Department of Energy and

Climate Change (DECC) also emphasises that the climate law has influence over how it is possible to work on climate issues throughout the Government. Climate change is higher on the agenda than it was previously, and any decisions that have positive climate effects will be prioritized when new policy is developed.

The message to the business sector has also become clearer: the UK is going through major changes and it will be necessary to make extensive investments in order to satisfy the relevant control. According to Bjartnes (2011), companies and business leaders plan the long-term low carbon strategies for their businesses. Britain is to be de-carbonized and the question is not how but when it will happen.

Introduction of the Climate Change Act comes with the introduction of carbon budgets, which set a limit on greenhouse gas emissions in each five-year period until 2050. The purpose of this is to ensure that there is a gradual reduction of emissions in line with long-term goals. The Government is obliged to set and maintain carbon budgets and to seek and consider the advice of the CCC. The CCC monitors the progress of the Government and reports to Parliament. If the Government declines to follow the Committee's advice, it must explain its reasons for doing so. If it fails to meet a carbon budget, it must take action and put forward proposals to compensate for the excess emissions.

3.2.1 ABOUT THE COMMITTEE ON CLIMATE CHANGE WITHIN THE ACT:

The Department of Energy and Climate Change (DECC), the Department for Environment, Food and Rural Affairs (Defra), and the Devolved Administrations in consultation with the Committee on Climate Change created a framework which guides how the CCC should work.

The Committee's tasks and role in management are carefully defined in the Climate Change Act; it is designed in a way that gives the Committee's publications high status and importance within the parliamentary system, both in relation to the executive and legislative

power. The Government must justify why they choose, if they do, to disregard the advice the expert body gives. The recommendations from the CCC thus hold a different status than advice from underlying administrative bodies that the Government can easily choose to ignore (CCC 2011).

To ensure its credibility, it is important that the Committee be able to clearly and rationally present the economics of the costs, benefits, and risks of abatement decisions. This means that the Committee's members should be experts in their field, rather than representatives of specific stakeholder groups, and should be supported by a secretariat with a strong base of analytical skills. The following list provides an indication of the types of expertise that will be desirable in the overall composition of the Committee: economic analysis and forecasting, business competitiveness, financial investment, technology development and diffusion, energy production and supply, climate science, emissions trading, and climate change policy—in particular its social impacts (Secretary of State for Environment Food and Rural Affairs 2007: 38).

The composition of the Committee was further developed in 2010. The Government stated that in addition to the fields of expertise mentioned above, the Climate Change Act requires securing that the Committee has experience and knowledge of certain topics. These topics include climate change policy at the national and international level, and in particular its social impacts; climate science and other branches of science; differences in circumstance between England, Wales, Scotland and Northern Ireland, and the capacity of national authorities to take action in relation to climate change (HM Government et al 2010: 18-20).

To gain a clearer understanding of how the Climate Change Act frames and defines expertise within the CCC, the next section of this thesis will investigate the different members of the board in the Committee.

3.2.2 THE COMMITTEE AND THEIR EXPERTISE

The CCC is composed of eight members: a chair, and seven independent members. The Committee employs a Chief Executive and a secretariat of around 30 staff to provide analytical and corporate support and advice. In addition, a statutory adaption sub-Committee (ASC) was set up from 1 April 2009 to support the Committee in its analysis of how Britain is adapting to climate change. Lord John Krebs, who also sits on the main Committee, is the chair of the ASC, which also has eight individual members. The sub-Committee utilises six of the CCC's secretariat staff (CCC 2011). It is important to include the information on the expertise of the members of the board, to clearly see how the Climate Change Act has framed and defined expertise within the CCC.

Lord Adair Turner is the chair of the CCC and a professor at the London School of Economics (CCC 2011b). Turner studied History and Economics at Gonville and Caius College, Cambridge from 1974 to 1978 (FSA 2011). Professor Samuel Fankhauser is a Principal Fellow at the Grantham Research Institute on Climate Change at the London School of Economics (CCC 2011b). David Kennedy is the Chief Executive of the Committee on Climate Change. He has a PhD in Economics from the London School of Economics (CCC 2011b).

There are three members who have more interdisciplinary expertise. Professor Jim Skea is Research Director at UK Energy Research Center based at Imperial College. Skea has operated at the interface between energy, climate change research, policy-making, and business throughout his career (CCC 2011b). Professor Michael Grubb is senior research associate at Cambridge University and holds a visiting professorship at Imperial College. His education is within the field of energy economics and policy processes. He is a Professor of Climate Change and Energy Policy (CCC 2011b).

The four last members have their expertise in the field of Mathematics, Biology and Theoretical Physics. Sir Brian Hoskins is a Professor of Meteorology at the University of Reading. Hoskins is a British dynamical Meteorologist and Climatologist (CCC 2011b). Professor Lord May of Oxford holds joint Professorship at Oxford University and Imperial College, and is a Fellow of Merton College, Oxford (Oxford University 2011). Professor Julia King is a Fellow of the Royal Academy of Engineering (Aston University 2011). Professor Lord Krebs is Principal of Jesus College Oxford. He studied zoology and population ecology of birds for his undergraduate and PhD degree at Oxford (CCC 2011b).

In section 3.2, I have gone through the creation of the Climate Change Act and some of the main points of the act. Showing what kind of expertise the various members of the committee have will provide a better understanding of the different fields that have to come together and produce a climate science they all agree on. Investigating the processes of how the Government selected the Committee members also shows how the Climate Change Act carefully defines expertise within the Committee. The Climate Change Act framed and defined the expertise within the Committee by stating the expertise that was relevant when choosing the members of Committee. The Climate Change Act also formed a framework document, which sets out a work-plan for the Committee. These two factors form the CCC and the expertise to provide a wider climate science. In the next section I will give an introduction to the Committee on Climate Change and my second research question.

3.3 THE COMMITTEE ON CLIMATE CHANGE

The CCC provides independent advice to the Government and devolved administrations on how Britain can best achieve its greenhouse gas emissions reduction goals, through setting

and meeting carbon budgets and targets, as well as other issues upon request (HM Government et al 2010: 3).

The CCC governance arrangements are fit to operate as a responsible and effective, non-departmental public body, meeting statutory and other requirements. To achieve this, the CCC adapts to corporate and human resources processes that will facilitate the hiring, retention, and development of a skilled and professional workforce. In addition, the CCC must also establish appropriate internal controls, controlling costs and driving efficiency while also ensuring that the independent financial reporting and accounting arrangements are in place. Furthermore, the CCC must create effective sustainable environmental policies, and develop and implement effective communications strategies for internal and external stakeholders (HM Governmental 2010: 4-6).

3.4 SECOND RESEARCH QUESTION: HOW DOES THE COMMITTEE ON CLIMATE CHANGE FRAME AND FORMULATE THEIR CONTRIBUTIONS TO THE ACT?

The CCC is a high profile and independent public body that provides expert advice on setting and meeting carbon budgets. To investigate how they frame and formulate their work, and thus make scientific contributions to the Government, I will analyse the contributions of the CCC and how they work, what kinds of methods they use, and whom they interact with to find answers to my research question.

The CCC builds their profile by communicating effectively with the Government, other organisations, and the public. The CCC does so by engaging with relevant stakeholders including Government departments, business and industry, NGOs and academics. Specifically, the CCC organises a series of sectorial workshops to share and develop approaches (to mention just a few). The CCC meets with stakeholders on a bilateral basis, presenting

findings extensively to organizations and conferences. They attend and contribute to international events such as the UN 2009 Climate Summit in Copenhagen, and they work with key international actors including the US Government and the European Commission. They also develop the CCC website as the primary tool of communication. Furthermore they continue to develop site content, work on search engine optimization, and inbound-linking work to drive up traffic to the site. They also produce a monthly e-newsletter for stakeholders, undertake on-line marketing survey work, produce news stories, press releases, speeches, events, newsletters, audio and video material. In addition, they raise the media profile of the CCC through ongoing public relations and media work including the following: placing regular articles in national and sector press, managing of press enquiries and holding regular relationship-building meetings with main national press contacts (CCC 2009).

The CCC and the ASC meet on a monthly basis to review findings and analyses. Moreover, the CCC meets every three weeks to discuss their work plan. They publish these meetings as *minutes of CCC meetings*. The Committee have held 37 meetings up until now (November 23, 2011) and they have published seventeen reports (CCC 2011c), of which the three annual progress reports, three corporate reports, and the Fourth Carbon Budget have been most significant.

3.4.1 PUBLICATIONS

The CCC works on the appropriate emissions reduction path to follow through the 2020s. As a result of this they published *the Fourth Carbon Budget* December 7, 2010. This report includes analysis of the power market reform, the carbon reduction commitment, and incentives for reduction of agriculture emissions.

The CCC published three annual progress reports during the time span between 2008-2011. As part of its statutory role, the Committee provides annual reports to Parliament on the

progress that the Government is making in meeting carbon budgets and in reducing emissions of greenhouse gases. I will give a brief summary of the main points in these reports, as this will allow me to investigate how they formulate their contributions to the Government.

In their first progress report, *Meeting Carbon Budgets -the need for step*[1] *change* (2009), the CCC focused on developing a monitoring approach which better enables them to track the progress of carbon budgets, and on identifying clear challenges likely to be faced in meeting the budgets. They also showed that emissions only fell slightly in the five-year period before the recession. The CCC then argued that a step change in the pace of emissions reduction was required to achieve the carbon budgets. The CCC developed a set of indicators, which made it easier to assess emission trends in future years (CCC 2009: 7-13).

In their second progress report, *Meeting Carbon Budgets-ensuring a low-carbon economy*, (2010) the CCC considered the latest trends in annual emission reductions relative to the then current budget limits. In addition, the Committee assessed progress against their future indicators, which determined whether they were on track to meet the future budgets. The UK's greenhouse gas emissions fell 8.6 percent from 2008 to 2009 with reductions of 9.7 percent in CO2 and 1.9 percent in non-CO2 emissions. According to the CCC, the reduction was largely due to the recession and other exogenous factors, which the Committee estimated could reduce emissions by up to 6 percent over the first budget period. By developing these new indicators the Committee implied that a step change in the pace of reductions was still required.

The Committee also recommended that new policies be introduced to strengthen incentives for energy efficiency improvement, investment in low-carbon power generation, development of an electric car market, and introduction of new practices in agriculture (CCC 2010: 5-45).

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[1] A noticeable improvement

In the Committee's third progress report, *Meeting Carbon Budgets —3rd Progress Report to Parliament —30 June 2011* (2011f), it is stated that the Government accepted the advice of the Committee on the fourth carbon budget. The Committee recommended that this should limit UK greenhouse gas emissions to a maximum of 1.950 Metric Tonne Carbon Dioxide Equivalent ($MtCO2e^2$) over the period 2023-27, and the aim should be to meet this budget through domestic emissions reductions. The analysis showed that it would be possible to meet this budget through deep cuts in emissions from power generation, heat in buildings, and surface transport. The Committee showed that such cuts are required if the UK is to meet its 2050 target of reducing emissions by 80 percent below 1990 level, and could result in wider economic security of supply and environmental benefits. According to the Committee, to achieve these deep emission cuts in the 2020s, it will require significant reductions over the next decade. In the Committee's first annual report published in 2009, they set out a framework of future indicators that enable the CCC to track whether steps are being taken to produce required emission reductions in subsequent years. For their second report in 2010, they developed analytical tools to isolate the impact of short-term economic fluctuations. These analytical tools showed that the 10 percent emissions reduction in 2009 was largely due to the recession. The third report (CCC 2011f) builds on the techniques developed in the first two. It adjusts recorded emissions in 2010 as well as macroeconomic impacts, showing that the underlying trend is one of broadly flat emissions. Analysis of the indicators meanwhile reveals mixed progress in implementing abatement measures. While emissions are continuing to run significantly below the first budget cap, acceleration in the pace of emissions reduction will be needed if future carbon budgets are to be achieved. The report highlights some key policies to drive this acceleration, including the Electricity Market Reform and the Green

[2] This is the standard measurement of the amount of CO2 emissions that are reduced or secluded from our environment.

Deal.

The CCC also delivered a report on Britain's aviation emissions, as requested by the Government. The report, *Meeting the UK aviation target —options for reducing emissions to 2050,* was published in December 2009. It assesses Britain's aviation emission reduction trajectories for the period from 2009-2050 under the alternative assumptions about demand and carbon efficiency improvement, whilst continuing to use fossil fuel based kerosene, and possible use of biofuels or hydrogen. Based on this analysis, the report considered any investments in infrastructure to meet the Government's target that emissions in 2050 will return to 2005 levels. The report also covers a high level assessment of a global deal on aviation emissions (CCC 2009b).

The last deliverable reports for the time period 2008-2011 are the annual reports and accounts known as corporate reports, which summarise key achievements against objectives and include audited accounts. In addition, the CCC discussed with the Scottish Government the advice it would provide to fulfil the advisory functions of the climate change (Scotland) bill. As a result of this, they published the *Scottish Report* (2009). Furthermore, the CCC also agreed with the Welsh Assembly Government that the CCC would support the climate change strategy for Wales; providing them with the *Welsh Program Report 2011,* and the report *Appropriateness of a Northern Ireland Climate Change Act* which they published in November 2011 (CCC 2011d).

The CCC works on the British framework for low-carbon research and development requested by the Department for Business, Innovation and Skills, on the appropriate level of the cap in the second phase of the carbon reduction commitment. Other reports that the CCC has published include: *Carbon Reduction Commitment 2010, Review of UK Shipping Emissions 2011, Building a low Carbon economy 2008,* and *Low Carbon Innovation 2010 and the Renewable Energy Review 2010.*

The CCC has published reports to produce the best scientific advice to the Government. The CCC exists to scientifically analyse how the UK can reduce its CO2 emissions now and in the future. I believe that the benefits of having such a Committee lie in the interdisciplinary solutions they provide in their analysis.

3.4.2 THE COMMITTEE AND THEIR ACTIVITIES

According to the British Government (2010: 3), the Committee works transparently, and consequently they provide data about their Government structure and how they spend their funds available to the public. The Climate Change Act requires the CCC to provide advice, analysis, information or other assistance to the Government. The Committee's statutory duties are to provide advice on the levels of the 2050 target, the levels of the carbon budgets consistent with the UK's 2020 and 2050 targets, and its international obligations. The CCC also provides advice on the extent to which carbon budgets should be met by domestic emissions reductions versus emissions credits purchased overseas, and on the respective contributions towards meeting the budgets by other sectors. These include the economy covered by trading schemes and the sectors not covered by trading schemes, the sectors of the economy in which there are particular opportunities for contributions to be made towards meeting the budgets through reductions in emissions. The Committee also gives advice on each carbon budget when it comes to the consequences of including emissions from international aviation and shipping.

The CCC must also advise in the following situations: before any amendment to the carbon budgets; before the Government includes more greenhouse gases in those targets; before the Government determines the base year for those additional greenhouse gases; before the Government seeks to use any banking or borrowing facilities; before the Government includes emissions from international aviation or international shipping within those targets;

before introducing the first set of regulations on carbon accounting; when any substantial changes are made to those regulations and before establishing any trading schemes under the Act (HM Government 2010: 4).

The CCC also assesses the progress made towards implementing the Government's objectives, proposals, and policies set out in the secretary of state's adaption programme. Furthermore, the CCC tackles climate change through building a low-carbon economy and by developing framework for adapting to climate change in Britain. The CCC achieves these objectives by providing independent evidence-based advice to the Government on the appropriate level of carbon budgets, target the steps required to meet them, monitoring progress in meeting carbon budgets and recommending any action necessary to keep budgets on track.

According to the CCC, they conduct independent research and analysis into climate change, science, economics and policy as these relate to carbon budgets. They also scrutinise the preparation of the British climate change risk assessment and implementation of the Government's adaption programme. Furthermore, the CCC engages in discussion with relevant parties with an interest in climate change to share evidence and analysis.

Investigating how the Committees ensure that their work reaches a wider audience also allows us to see how they facilitate and provide this information and to what degree they want or get any response to their work. This is also interesting because it shows how the Committees view themselves as a joint expert group.

3.4.3 THE MODELS THAT THE COMMITTEE USES

The CCC fulfils their duties under the Climate Change Act by reporting on progress made in meeting the carbon budgets. The CCC achieves this by continuing to build an evidence base

on realistically achievable emission reductions required to meet budgets and an action plan on how to deliver these reductions. The CCC framework document (2010) includes the various models, which the CCC will have access to or use of with varying degrees. These are: Poyry Energy Consulting Carbon Price Model; UK Air Passenger Demand & CO2 Forecasting Framework; UK Energy Model Environmental CGE Model; Global Damage cost, macroeconomic cost and burden sharing modelling; Non-CO2 GHG Modelling; Agriculture abatement, National Transport Model; Fuel Poverty Model; UK MACC Models; UK Macroeconomic modelling, e.g. MARKAL-Makro; Global Carbon Finance Model and the Energy Use in Industry model (HM Government et al 2010: 14-15). Furthermore, they have also developed a set of leading indicators to inform the design of a strategy for meeting carbon budgets and against which progress in reducing emissions can be effectively monitored (CCC 2009).

To establish credibility of the carbon budgeting framework, it is important that analysts in the UK Government and Devolved Administrations have a shared understanding of the assumptions on which the Committee will base its advice, and the Committee must maintain their analytical independence. A memorandum of understanding on economic modelling and sharing of analysis and research between relevant UK Government Departments, Devolved Administrations and the CCC was signed on 1st May 2009 (HM Government et al 2010: 13-14).

Pointing out which models and theories the Committee chooses for their analysis is important to further investigate on what expertise they find relevant in their work.

3.4.4 THE ROLE OF THE COMMITTEE IN POLICY

In this latter part of chapter three I have described the Committee on Climate Change that was implemented as a part of the Climate Change Act. By analysing and describing the CCC, I

discovered that the Committee holds annual meetings, discussion groups, and minute meetings. They engage with representatives interested in climate change from across the UK to share research and information on climate change. The CCC produces reports on the progress made in tackling climate change as well as other reports on a range of issues relating to climate change.

The Committee's primary role on policy is to provide advice to the Government on the level of carbon budgets and report to Parliament on progress towards these goals. The Secretary of State of Energy and Climate Change in consultation with the Devolved Administrations is responsible for making decisions. It is the responsibility of the national authorities to ensure that arrangements are in place to inform the Committee of relevant UK Government and Devolved policy in a timely manner (HM Government 2010: 14). The CCC has been given the position, which makes them partly responsible of reaching a reduction in the GHG emissions. The CCC advises the Government on how best to reach the goals. This offers a better dialogue between policy and research and together they can achieve far more. The CCC works hard to be transparent and share their work through their blog, monthly newsletter and reports, all published through the webpage theccc.org. The Committee on Climate Change framed and formulated their contributions to the Act by creating their own profile. The CCC publishes scientific reports and ensures that their knowledge reaches the wider public. They do so by using their own website, communicating with different stakeholders, through publications and on advising the Government.

To further analyse, the Committee and how they as a group of experts work, I will use Harry Collins and Robert Evans' (2002) article the *Third Wave of Science studies* and the responses to the report made by Jasanoff & Wynne (2003).

4. THE DEBATE OF CLASSIFYING EXPERTISE AND THE COMMITTEE ON CLIMATE CHANGE

4.1 THE COMMITTEE ON CLIMATE CHANGE IN LIGHT OF COLLINS AND EVANS

The words expert and expertise are mentioned several times in CCC publications and the Government determined the expertises within the Committee. Because *"The pace of politics is faster than the pace of the scientific consensus formation (Collins and Evans 2007: 269)"* political decision makers are forced to redefine what it means to be an expert. I will now conduct an analysis of the CCC in light of arguments put forth by Collins and Evans.

4.1.1 THE CLIMATE CHANGE ISSUE AND THE CORE-SCIENTISTS

During my analysis of the Climate Change Act and the CCC, I discovered that the UK Government has tried to form a Committee of experts to widen the knowledgebase on climate change. The Government has tried to gather a group of the best scientists so they can get the best scientific advice for producing policy. This effort is in line with Collins and Evans way of thinking on how best to make use of experts. Analysing the Climate Change Act and the CCC in the light of Collins and Evans has created some questions for further investigation. What is it that the Government is trying to do by creating this Committee of experts, how is the Committee formed, and what kind of results do they produce? Is it possible to use Collins and Evans to reflect upon how the Government tries to form a core-set? A core-set evolves naturally as a group of the best scientists within a field come together to share the expert knowledge within that specific field. The British Government performs the task as Collins and Evans wanted them to, because they agreed on the problem and created a group of experts to solve this problem. Although it is too early to know the result, we can evaluate this

experiment.

According to Collins and Evans (2002: 242), core-scientists are the most competent scientists in a specific field of research. Identifying these core-scientists ensures the highest level of expertise. According to Collins and Evans, core-scientists will be able to produce the best science possible, as long as the fundamental research question is agreed on. Once the experts are identified and the research question firmly established, then gathering this group of the best experts will create the best advice. When the UK established the Climate Change Act, the Department of Energy and Climate Change (DECC), the Department for Environment, Food and Rural Affairs (Defra), and the Devolved Administrations together created the Committee on Climate Change. Now that this Committee has been formed, they are expected to collect and convey the best possible scientific advice so the Government can make the best policy possible regarding the reduction of carbon emissions.

However, the foundation of the knowledge is important in decision-making and the boundaries surrounding the classification of experts are not always being easy to establish. For example, as Collins and Evans (2002: 268) explain when they write about the problem of historical science in the Third Wave of Science Studies, there exist scientific controversies in which it is not to be expected that there will be any closure in the core-set debate in the foreseeable future. The question of global warming is a historical question. The ecological effects, as opposed to the effects on single organisms of GMOs, are historical problems. Closure on these topics should not be expected in the foreseeable future because the whole system in which they are embedded is too complicated to model accurately. According to Collins and Evans (2002: 269), in the case of historical sciences, because the role of political and social interests is especially prominent, there is no hope of any major increase in scientific input. For this reason, these historical policies rely on the participation of the lay public (or at least a large portion of it) for their success.

In reflecting upon the subject of climate change issues and the difficulty in establishing an agreement between experts, Collins and Evans (2002: 243), as members of the scientific community, broadly maintain that scientists have special rights when it comes to decision making in scientific disputes. They believe that this is a reference to our culture rather than a reference to the way political legitimacy is granted in our society. By saying it is a reference to our culture Collins and Evans point out that if one takes an esoteric scientific controversy—such as that over the likelihood that binary neutron stars will collapse into black holes just before they spiral into each other members of Western society know, without having to worry, that anyone who is not a recognized physicist with a great deal of equipment or special theoretical knowledge would not and should not be counted as a member of the set of scientific decision-makers with regard to this issue Were members to take a different view of this matter they would no longer participate in Western scientific society as the term is used by Collins and Evans. If we have a problem that requires scientific knowledge, we should listen to the scientists, but there must be an agreement on the scientific problems and the sciences in order to grant scientists the authority to provide solutions. Thus would Collins and Evans be positive to the Committee since the members of CCC are experts and there is an agreement on the science within the Committee.

To further investigate this issue, I will analyse the CCC in light of Collins and Evans' thoughts on the concepts of contributory expertise and public participation.

4.1.2 PUBLIC PARTICIPATION

By investigating the members of the board in the Committee, we can see that they come from different backgrounds and disciplines. Each one of these fields has their experts and some have their own core-scientists. Moreover, each of the members has contributory expertise in their own scientific field. The Government has in this case tried to form a Committee of

experts that holds the best knowledge and expertise. The Government wants to create a Committee where the members understand and communicate with each other fluently. In this way, they can collaborate to create the strongest advice that the Government can then use to create the best policy in a way that benefits society. This goal of communication within the Committee fits well with Collins and Evans' (2007) thoughts on the concept of contributory expertise. Contributory expertise is what fully socialised members of a community possess. It refers to the ability to engage in the full range of activities associated with membership of a community. This encompasses tacit knowledge, practical and craft skills, and linguistic skills. The Committee is formed by the Government to contribute with scientific knowledge to making policy.

A good way to examine the way in which the CCC considers their own expertise is to show how they interact with society. According to the CCC (2011e: 9-10), during the last years they have continued to build their public profile. They have engaged with a large network of stakeholders in the climate change mitigation and adaptation field. Moreover, the CCC will focus on improving the way they interact with various stakeholders. They are achieving this by introducing innovations to the way that they communicate through the website, publications and social media. To highlight some of their efforts to reach out to the public, the national newspaper coverage about the Committee reached around 10 million readers each month. The CCC's digital presence was improved through the redesign of their website and launch of social media. As a result of these changes, the Committee's website received 100,000 visitors over the year of 2011, an improvement of 8 percent on the previous year's traffic. The Committee was shortlisted as a finalist in the Climate Week Awards in recognition of the innovative analysis, which informed their 4th carbon budget report. Furthermore, they introduced a more efficient process for producing reports from templates in order both to reduce their own carbon footprint and to reduce costs. Over the next years, the

CCC will continue to publicise their work, ensuring that the recommendations made by the Committee are understood and have impact on the public. The CCC goes to great lengths to provide the wider public with their scientific expertise but the opportunity for the public to respond is limited. This is much in line with Collin and Evans (2002) way of saying that scientist have special rights in esoteric issues.

4.1.3 CONCLUDING DISCUSSION OF COLLINS AND EVANS

The members of the Committee have been selected for the expertise they posses within the various scientific fields that they originally worked in. The ambitions of the Government are to establish a Committee that can make broader climate science than that which exists today. I believe Collins and Evans likely would approve of the Committee yet consider it more like an experiment. It is an experiment in that the Committee could establish a core-set over time, but that it is much too early to evaluate the long-term results of creating this Committee. There are, however, problems with the members of the Committee and contributory expertise. Having contributory expertise means that they can discuss and interact with each other without asking questions because they are fluent in their field and understand exactly what the other scientists are talking about. Yet these experts come to the Committee from various disciplines, thus they have to communicate on another level; they must ask questions and learn to understand one another. A core-set as well as having contributory expertise is something that is shaped and created over time. It is not possible to create an entirely new scientific discipline and a core-set overnight.

Collins and Evans' ambition with their project is to identify the best expertise. As Collins and Evans (2007: 269) stated, "the pace of science is slower than the pace of politics." The CCC has worked in a very short time period while at the same time trying to create a, broader scientific discipline in a new way also not forgetting to mention the difficulties in reaching a

consensus when discussing environmental issues. Furthermore, it is difficult to define the CCC as a core-set as of now. Over time, however, the CCC can establish or develop a group of experts (a core-set) that are skilled in this discipline. This will be possible if they have established an agreement on the scientific questions and established an idea of contributory expertise within their own new field.

According to Collins and Evans, if we want to solve the climate problem and we agree that this involves a question of knowledge, then we should do as they have done in the UK. We should establish an organisation whose purpose is to guide the Government in the right direction.

The exciting part here is that my analysis of the CCC revealed that the Committee itself claims to be a core-set and they believe they have the authority to give advice within the field. This is well in line with Collins and Evans' idea on how to best resolve scientific disputes. During my study of the CCC, I did not discover any disagreements within the group. They are united as a Committee; they publish their reports and interact with the public in a way that communicates the idea that their research is highly accurate and best suited for providing the Government with valuable advice. There may be some difference between what goes on amongst the board members and what they communicate to the public.

The boundary between science and politics is exciting, as are the boundaries between giving advice and creating policy. Researchers can answer questions, which pertain to propositional knowledge, but most policies also shape the propositional knowledge in some way. However, when discussing the interaction of politics and science, Collins and Evans find it difficult to classify expertise. Collins and Evans (2002) claim citing the legitimacy of including public views in considerations related to technical decision-making does not by the very fact tell us how far that participation ought to extend, unless expertise is to fall down into politics, then one must decide where the boundaries should be drawn. The category of

expertise was thus expanded beyond qualifications to include interactive abilities and contributory experience (experience that was continuous with core-set specialists even if it was not accompanied by qualifications). With already settled science, experts would have priority to make judgments, but in cases like climate change where uncertainty and disagreement prevails, political decisions would need to be made so as to contextualize what was needed or desired from science. The guiding principle offered by Collins and Evans is thus to deny epistemic rights to groups simply by virtue of those groups' claim to political rights and, because epistemic and political rights are conceived of as distinct, this preserves the convention of denying that politics is a legitimate influence in the making of technical decisions.

Collins and Evans are claiming that experts are the bearers of such rights only in their capacity as qualified and experienced (individual) agents, and that technical rights should not be extended to groups in their capacity as bearers of political/cultural positions and identities. Collins and Evans would likely approve of the idea of the Committee as an experiment in which science is produced with a higher level of speed as politics and the fact that experts have an important role in providing science to the Government, but they would remain unsure of the outcome because it is to early in the process.

The CCC does make efforts to be transparent and democratic; therefore I now continue to test my case study by using Sheila Jasanoff and Brian Wynne's critique of the Third Wave of Science Studies, which discusses the problems surrounding public participation and framing.

4.2 THE COMMITTEE ON CLIMATE CHANGE IN LIGHT OF JASANOFF AND WYNNE

As a natural response to the way Collins and Evans would likely view this case, I will expand upon this idea by using Jasanoff and Wynne to analyse the way in which "public issues are framed and thus given meaning" (Wynne 2003: 402). Although I believe that Jasanoff and

Wynne would likely approve of a Committee such as the CCC because they think of it as only one frame, or just one approach to the problem among many other solutions, they would likely question the expertise and the knowledge that the experts choose to be the salient one.

Jasanoff (2003) and Wynne (2003) have responded to Collins and Evans by defending public participation in science policy. Hence Collins and Evans do not deny the points Jasanoff and Wynne offer in critique. Jasanoff and Wynne's real challenge begins when they defend public participation as an aspect of good democratic decision-making: public participation acts as a democratic check on the scope of expert judgment (Jasanoff 2003). According to Wynne (2003) does functioning democracies minimize the exclusion of potentially affected groups and/or operate best when an audience as wide as possible sets agendas. The question this dispute raises is whether limiting the public enhances liberal democratic decision-making forums. Moreover securing the participation of experts, or by limiting experts and thereby securing the participation of the public.

To demonstrate this point, I will investigate some of the different frames of scientific knowledge that the CCC has produced during their time as a Committee.

4.2.1 FRAMING AND THE QUESTION OF PROPOSITIONAL KNOWLEDGE

Wynne asks how public issues are framed and thus given meaning. He raises questions about how proper knowledge for relatively new domains such as environmental risk problems should be negotiated as matters of what Sheila Jasanoff calls civic epistemology[3] (Wynne

[3] Sheila Jasanoff defines civic epistemology as "the institutionalized practices by which members of a given society test knowledge claims used as a basis for making collective choices." That is, civic epistemology encompasses facets such as styles and evidentiary standards for articulating knowledge claims; the empowerment of societal actors in determining who has expertise; building institutions to adjudicate between different knowledge claims; and developing hybrid knowledge through environmentalist-industry alliances (Jasanoff 2005).

2003: 402). Recognising these issues provokes questions of how definitions of public issues are established and maintained, and thus what becomes salient and what is deleted from collective attention. By examining relevant cases like the Climate Change Act and the CCC, we can investigate the knowledge and framing they have chosen as important. To show this in the best way, I have analysed different framings of some of the advice given to the Government by the CCC in their reports.

For example, when discussing the CCC I found that one of the sectors within the CCC called "Surface Transport" suggests that the UK should use bio-fuels. The analysis provided by the Committee supports the findings of the Gallagher review (2008) into bio-fuels, which stated that by 2020, 8 percent of total fuel sold on the UK's forecourts could be made up of biofuels produced from sustainable sources. This could be, for example, biodiesel produced from rapeseed oil (CCC 2011b). However, I did a study on agro-fuels/bio-fuels in my bachelor thesis where I investigated different contexts within the environmental discourse regarding the subject of agro-fuels. The conclusion of my thesis was that one must consider a more examined and comprehensive way of investigating the topic to see whether agro-fuel is profitable both financially and environmentally (ActionAid 2008)[4]. One must consider factors beyond just CO2 emissions. The study shows, among other things, that agro-fuel affect food prices (Christian Aid 2009), food security (Bello 2010), and promotes land-grab (Third World Network 2010). These consequences put people into poverty, and in some cases produce more CO2 than oil (Friends of the Earth 2008). The study also showed that too little research has been done on agro-fuels and that 2nd and 3rd bio-fuel generation might be better alternatives (Biofuelwatch with more 2007). More research on developing the technology of the

[4] "Life Cycle Assessment" is a key tool to evaluate impacts associated with biofules. In theory, this procedure considers the full impact of the entire lifecycle of a product. In practice, usually the most emphasis is on the prominent effects that the cycle has on land use, energy use and greenhouse gas emissions. Several of the assessments techniques are better suited to investigate local environmental issues as air pollution and changes in the biodiversity (ActionAid 2008).

consumption of gas in car engines would give better results than producing agro-fuels (Christian Aid 2009). I realise that my bachelor assignment does not have any direct links to the reports published by the CCC, but the big picture of different contexts remains relevant here. The Committee suggests that 8 percent of the total fuel sold in the UK should be replaced by Bio-fuels to cut down carbon emissions. By investigating other framings of the same solution, provides more knowledge that should be included in the process of producing the solution.

Carbon budgets are another controversial subject as part of the recommendations made by the CCC. Within the CCC reports, the first three budgets have been proposed for 2008 until 2022 along with the recommendation that they apply to all Kyoto[5] GHGs, not just CO2. In line with the EU climate and Energy package agreed upon in December 2008—to which the UK is legally committed—the CCC recommends that the UK Government set two target budgets. The initial *interim* budget would apply immediately. The second *intended* budget, entailing more demanding cuts in emission, would apply if and when a global agreement is reached (CCC 2008: 159).

However, according to a report entitled *Making a Climate Commitment: Analysis of the first Report (2008) of the UK Committee on Climate Change*, the pathways and budgets within the report allow for varying amounts of reduction in emissions of carbon dioxide or greenhouse gasses made in order to compensate for or offset an emission made elsewhere

[5] The Protocol defines several mechanisms ("flexible mechanisms") that are designed to allow countries to meet their emission reduction commitments (caps) with reduced economic impact. Under Article 3.3 of the Kyoto Protocol, Parties may use GHG removals, from afforestation and reforestation (forest sinks) and deforestation (sources) since 1990, to meet their emission reduction commitments. Parties may also use International Emissions Trading (IET). Under the treaty, for the 5-year compliance period from 2008 until 2012, nations that emit less than their quota will be able to sell Assigned amount units to nations that exceed their quota. It is also possible for countries to sponsor carbon projects that reduce greenhouse gas emissions in other countries. These projects generate tradable carbon credits that can be used by countries in meeting their caps. The project-based Kyoto Mechanisms are the Clean Development Mechanism (CDM) and Joint Implementation (JI) (UN 2011).

(offsetting). Such offsetting may be done through the EU Emission Trading Systems (ETS), or the conventional instruments provided within the Kyoto Protocol. The extent to which offsetting can occur, and the quality of the offsetting in relation to equivalent emission, is a way to measure and describe how much global warming a given type of greenhouse gas may cause. Using the functionally equivalent amount or concentration of CO2 as the reference credits to achieve the total amount of the emission reduction required, has significant implications for the UK's climate commitment. Since the CCC published its Report, the EU has revised the EU ETS Directive as part of their new climate and energy package (Bows et al. 2009: 12-17). This means that the UK's combined traded and non-traded sectors could buy out approximately 17 percent and 27 percent of the reductions necessary under the interim and intended pathways respectively. In other words, the UK could reduce the effort necessary to meet the interim pathway by 17 percent and the intended pathway by 27 percent, with the effort essentially transferred to less industrialized nations outside of the EU. Taken to its limit, the UK could purchase all the traded sector emission reductions from within the EU and 23 percent of the non-traded sector reductions from outside the EU. In theory, at least three quarters of all the UK's emission-reduction effort to meet the CCC's intended pathway could be undertaken outside of the UK. The figure is 65 percent for the interim pathway. This will prevent the reduction of CO2 emissions now and in the future (Bows et al. 2009: 21-23, 31-32). Furthermore, the CCC does not discuss the issues regarding lock-in[6]. According to a

[6] Lock-in describes the circumstances whereby society becomes committed to a particular future emissions pathway through the investment choices made by governments and industry. Developed from evolutionary economics, lock-in takes account of how technologies become intertwined with institutional and social processes, making it difficult to shift to alternative ways of doing things. In relation to climate change, lock-in is often used in conjunction with terms like energy intensive or high carbon to indicate present day investments in capitally expensive high-emitting infrastructure and processes. In the case of major public infrastructure such as power plants, transport networks, and the energy distribution grid, the lock-in effect is likely to endure for several decades, thus frustrating subsequent efforts to mitigate emissions (Bows et al 2009: 27).

report by the Tyndall Centre, a significant weakness of the CCC's progress reports arises from a combination of its support for relatively high levels of buy-out and trading. The implications of this are difficult to exaggerate and have the potential to inadvertently lend credibility to Governmental decisions that cannot be reconciled with the CCC's own carbon pathways. The findings of the Committee's reports could be used to justify a program of new coal-fired power stations, provided they were constructed as capture ready. Nevertheless, this would lock the UK into high levels of cumulative emissions, regardless of whether capture technologies were retrofitted or not. However, whilst the electricity from coal-fired stations does not necessarily lock-in end-user practices alternative low-carbon electricity is available, this is not the case for some other lock-in policies.

Announcing the go-ahead for the third flight runway, the Government claimed that UK aviation emissions in 2050 would be no higher than they were in 2005. This in stark contrast to the Department for Transport's report published on the same day, and in which aviation emissions are predicted to increase by 60 percent by 2050. This "apparent" contradiction, however, was plausible as the Government were relying on purchasing the necessary emissions from outside of the UK. This is an approach broadly supported by the CCC's report, both explicitly in terms of buy-out and trading and implicitly through its neglect of social practice lock-in. Once the new runway is constructed, there will be increased pressure for additional terminals. The provision of new capacity will lead to additional demand, new routes, increased frequency, and new aircraft all contributing to new and reinforced practices for which few alternatives exist. Businesses develop overseas markets and international conferences become the norm. In contrast to the electricity generation, there is little opportunity for alternative low carbon solutions to replace them (Bows 2009: 32-33).

In the article: *From long-term targets to cumulative emissions pathways: Reframing UK Climate Policy* by Anderson and Bows (2008: 3714-3722), the authors of this article question

the problem of using the 2°C as a base for whose reports. Since the publication of the IPCC last report, there is evidence both from within the scientific and to a lesser extent, the policy community, of an escalating uneasiness with the rhetoric of 2°C and its subsequent implications for effective policy. Increasingly, it is becoming evident that even if all orthodox mitigation measures were implemented as a matter of urgency, it would be difficult to avoid temperatures rising by less than 4°C. However, even this would require rapid curtailment of deforestation, a radical reversal in emission trends from food production, and urgent decarbonisation of the global energy system.

According to Bows et al. (2009: 29), the rhetoric of the 2°C threshold continues to subvert meaningful scientific and policy dialogue on mitigation and as a consequence, adaptation. Whilst the CCC Report demonstrates significant independence from the political process, it is nevertheless constrained by the analytical limitations imposed by the Government's repeated commitment to 2°C. The report certainly makes challenging demands of policy makers. The CCC's reports are therefore inevitably and significantly compromised by its implicit need to deliver demanding but nonetheless politically acceptable conclusions in line with the 2°C threshold.

In this part of my analysis I have put forth different interpretations of the proposals that the CCC has created as a contribution to the Government. These different framings include mainly that replacing the total fuel sold in the UK with bio-fuels is problematic according to research provided by different organizations. Furthermore, I showed the different contexts regarding the concept of lock-in. I also showed that sometimes politics establish science such as the question of the 2°C versus the scientific 4°C. Whereas the 2°C is the goal of almost all climate strategies but the consensus within the scientific field of climate change is that we most likely have to look at the possibilities of an increase in temperature with 4°C.

Jasanoff explains the framing of scientific issues well when she describes it as the problem of different "life worlds" entailing altogether different perceptions of uncertainty, predictability, and control. The knowledge stemming from these divergent experimental contexts was more than a simple addition; it represented radically "other" ways of understanding the world. This is why it is always important to test and question expertise (Jasanoff 2003). By analysing different contexts done on the Committee's own advice to the Government can we further investigate what knowledge and expertise was chosen over other knowledge and expertises.

4.2.2 CONCLUDING DISCUSSION ABOUT FRAMING AND PROPOSITIONAL KNOWLEDGE

It is the classification of experts that concerns both Jasanoff and Wynne. The categories of expertise, expert faculties, and sciences are intended to help the public and decision-makers to draw the line between appropriate and inappropriate inclusiveness in technical debates conducted in the public domain. This is a complex architecture for an issue that is far older than the concern of contemporary science studies; the field of law, for instance, has been grappling with institutional problems of expertise since the late 18th century (Jasanoff 2003: 391). There is much controversy surrounding the classification of expert groups like the CCC and the scientific knowledge these experts decide to produce. It raises a problem such as which propositional question and knowledge proves salient (Wynne 2003: 402). To reinforce her point, Jasanoff (2003: 392) refers to literature from the field of STS such as the works of Shapin and Schaffer, Ezrahi and Latour, noting that none of these authors essentialise the nature of expertise, showing it instead to be always historically situated and grounded in practice. The Government provided a framework, which the CCC works within. Thus creating a co-production of science and policy, where the policy, shapes the science of a Committee, which is supposed to provide independent research. To ensure that science remains reflexive,

it is important to open up to different frames and public participation. The framing of the problem or issue therefore deserves far more attention in Collins and Evans' normative theory of expertise, for as Wynne (2003: 410) points out, context may become content. Yet Collins and Evans (2007: 125) pay little attention to this in their book *Rethinking Expertise*, apart from a little note towards the end addressing the issue of framing where they state that if, in our society, we want to retain the idea of Western science, we must want our scientists to be right. Collins and Evans ask if science should be a democratic process or be based on the best expert advice. Jasanoff (2003) explains that we need both strong democracy and good expertise. According to Wynne (2003: 410), Collins and Evans would reduce public policy and the larger public arena in which negotiations of meaning, authority, and legitimacy take place to what Habermas (1975) long ago critically dismissed as decisionism. This is a model in which policy and political processes are conceptualised exclusively as a series of completely unrelated specific decisions, without the interaction between process and policy.

5. FINDINGS AND CONTRIBUTIONS

During the analysis of the Climate Change Act and the CCC, I discovered that the Government has tried to form a Committee of experts to widen the knowledgebase on climate change. In order for the Government to produce the best policy to improve the climate in the UK, they must be able to rely on the best scientific advice possible. The Climate Change Act can also possibly set a good example for the rest of the global community. These attempts are very much in the line with scholars Collins and Evans in their effort to promote the classification of expertise. Collins and Evans would like us to listen to and not interfere with the experts if the problem needs an expert-based answer.

However, the risk associated with this is the empowerment of the technocratic society. According to Jasanoff and Wynne, science must always be tested because it is a problem for propositional knowledge to decide what constitutes as the truth. The concept of co-production, as discussed by Jasanoff (2004) and Miller (2004), can provide better insight into the efforts of Collins and Evans to create a normative classification of expertise. Involving the public would as I see it force the Committee to investigate and discover different contexts in scientific disputes. By emphasizing the difficulty of separating facts from values, the STS literature has been highly effective by giving a new understanding of how the authority is established. The problem of knowledge is not so much between different knowledge claims as it is between the different sets of values and commitments they embody (Evans and Plows 2011). In this thesis, my findings illustrate the way in which the Climate Change Act and the CCC have framed and formulated expertise and contributed to producing scientific advice, thus contributing to make the best climate policy. This is an exciting experiment and time will tell whether it succeeds. Although the CCC makes an effort to promote their advice and knowledge, I believe they must be more open to public participation, thus to the different framings of propositional knowledge. The policy shapes the science by providing the

framework that maps out the role of the independent body the CCC this does create a conflict of interest, a co-production of as Jasanoff (2003) called it "different life worlds." Because of this the Committee would benefit from including as many different contexts and framings as possible in order to produce the best science. Because the different frames provide knowledge and expertise that can prove valuable in developing a broader climate science than exists today.

During my research I established three research questions; I will now go through them to explain my findings. Research question number one: *How does the Climate Change Act frame and define the expertise within the Committee on Climate Change?* My analysis shows the process of carefully defining expertise by creating a framework that explains how the CCC should work and choosing the different expertise that the Government wanted the members of the Committee to have. The Government chose eight members from different disciplines; they are the foundation for creating an expert group on a broader climate science then we have today. The framework is designed in a way that gives the Committee specific work tasks. Analysing these tasks gave me the opportunity to find out how the Climate Change Act frames expertise within the CCC. Investigating the criteria on which the members were chosen allowed me to examine how expertise was defined within the Committee. The Climate Change Act created a framework document. The document carefully defined the different types of expertise and qualifications that the different members had to possess. The document also mapped out the different models and established climate science, which the Committee were to use in their work.

My second research question was as follows: *How does the Committee on Climate Change frame and formulate their contributions to the Climate Change Act?* By analysing the products made by the Committee, I was able to look at the way in which they worked and the scientific knowledge they choose to include in their reports and advice. The CCC has been

given a position of power in relation to reducing carbon emissions by advising the Government on how best to reach their goals. The Committee presents themselves as a group with a common goal: they publish reports, hold meetings, and aim to get their message out to the public. However, there is not much evidence that the public has any channel to respond to the work of the Committee.

My third and last research question was: *How will analysing and evaluating the CCC contribute to STS scholars Harry Collins and Robert Evans' efforts to create a normative theory of classification of expertise?* This research question was important to shed light on the ongoing debate on defining and classifying expertise. My analysis contributes to this debate by analysing the CCC and the Climate Change Act using theory and concepts from the field of STS. By analysing the CCC, I discovered how the Government created a group of experts to solve political problems, which the Government could then use to make policy. This is much in line with Collins and Evans' way of thinking. There were some similarities between Collins and Evans and Jasanoff and Wynne regarding the issues surrounding climate change policy, science, and public participation. According to Collins and Evans, reaching an agreement on controversial historical sciences like climate change is difficult and therefore requires public participation. Wynne and Jasanoff argue that the different contexts provide different solutions, and these different contexts can be provided by public participation. According to Jasanoff, expertise needs to be tested; for this reason, it is necessary to investigate different solutions.

Although it might look like Collins and Evans fully agrees with Jasanoff and Wynne. However, this is not the case. If there were a scientific dispute that experts agree upon and the scientists found a scientific solution to this dispute, then this would be the framing that Collins and Evans would rely on. Collins and Evans would no longer be interested in any other way of solving the problem. Jasanoff and Wynne however, would see this frame

provided by the experts as just part of the solution and would look for more framings rather than choosing just one. They believe that it is a democratic check on the experts to provide as many frames as possible. Analysing the CCC I believe that there is a need to classify experts in our society because the Committee has been able to produce scientific advice in the pace of politics and thereby contributing to a more science based policy. Although I agree with Collins and Evans I also believe that the Committee as an independent group of experts would benefit from public participation to provide as many frames as possible to ensure the best scientific results. Also to avoid that science is separated from society and remains reflexive, makes it important to use public participation and frames as way to make sure that science is always challenged and tested.

Furthermore, I presented some of the different framings of the published advice made by the Committee. In spite of the attempts of the Committee to be open and transparent, room for public participation remains limited. The Committee would benefit from organising an open forum where they can interact with the public so that the interplay between the public and Committee can grow stronger. By doing so, the CCC will have the benefit of yet another analytical tool in their efforts to provide the best climate science for advising the Government on carbon reduction in the UK.

My research is inspired by the work of Harry Collins, Robert Evans, Sheila Jasanoff, and Brian Wynne. The findings in this thesis are also inspired by the work done on framing and expertise. My case provides insight to the interplay between science, policy, and expertise by taking as its case study a group of experts producing scientific advice on how to make the best climate policy possible. Thus contributing to Collins and Evans' development of the classification of expertise, my thesis is however not written to prove who qualifies as an expert or which framings are the right ones; rather, it aims to discover the processes around

the classification of expertise in order to get a better understanding of this part of the STS field.

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